

Objectives

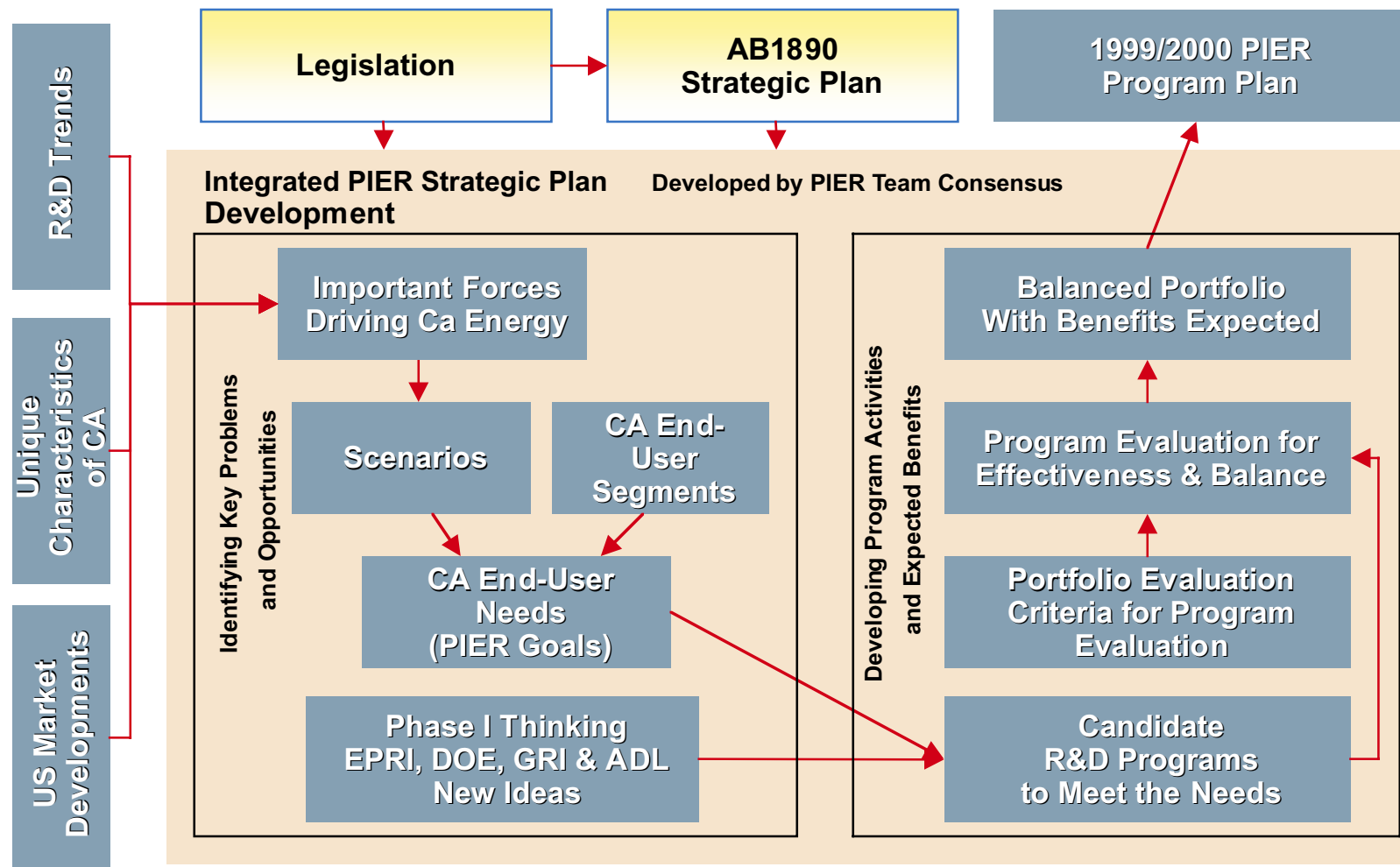
The primary objective of the PIER Innovation Strategy Project is to develop a robust, solutions-oriented portfolio of RD&D programs that are aimed at maximizing end user benefits across the six PIER focus areas.

Objectives

- ¥ Align technology investments with the legislated objectives of the PIER Program**
- ¥ Integrate the six Subject Area Plans into an Overall PIER Innovation Strategy**
- ¥ Explicitly link selected programs to Public Interest Criteria and provide a rationale for focusing on selected areas**
- ¥ Develop an ongoing technology strategy process that is practical and effective**

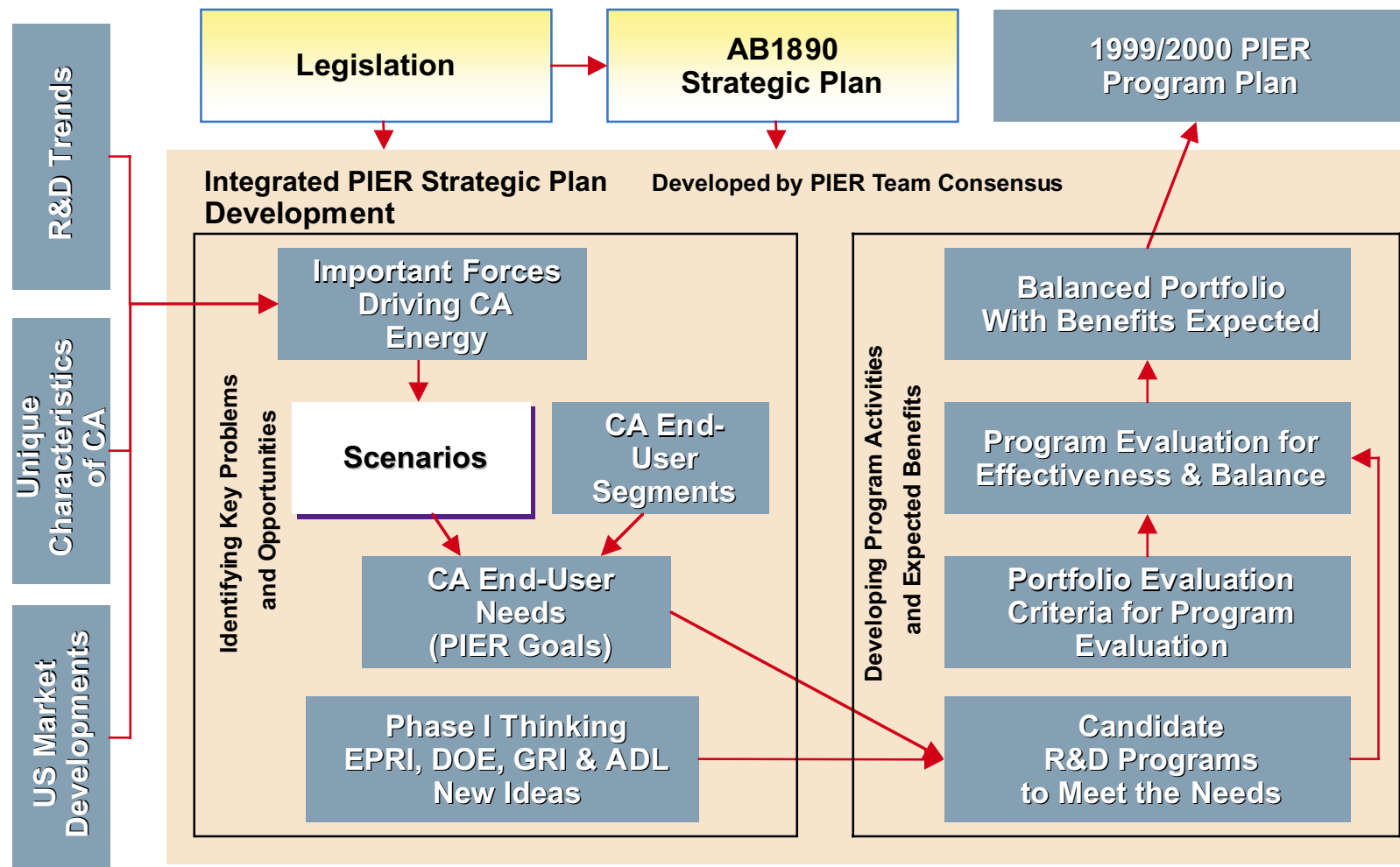
Developing a PIER Integrated Strategic Plan

The PIER Team has focused on developing a California-specific strategy for Public Interest R&D. It includes linkages connecting the PIER mission to program strategy and expected benefits, reflecting IEP and PAC comments.



Developing a PIER Integrated Strategic Plan - California specific scenarios

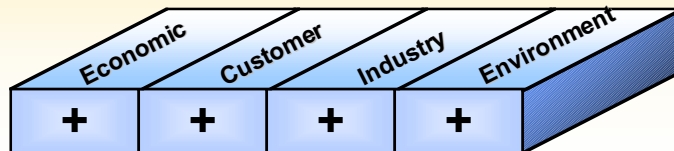
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It was important that the Scenarios Stretch the Canvas of possible futures while remaining within the realm of possibility.

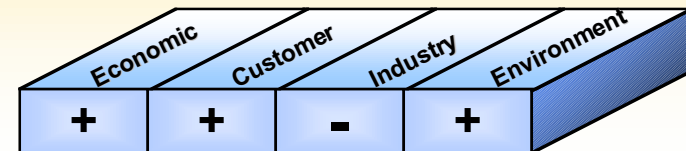
Age of Idealism

A robust economy and aggressive customer demands for choice have created an Age of Idealism and have fostered dramatic energy industry changes and sweeping environmental reforms.



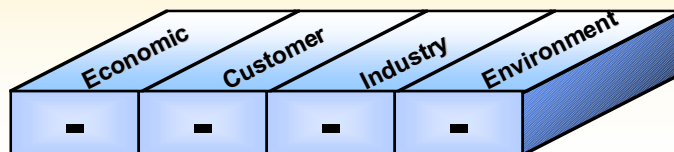
Industry Reticence

Enabled by a robust economy, customers are demanding new energy products and services; however, industry participants that enjoy market power lack the incentive to satisfy these demands.



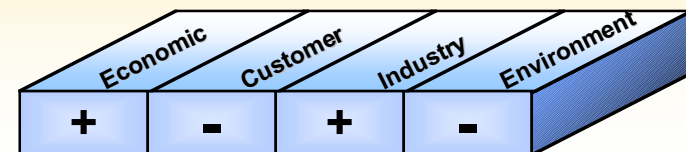
Retrenchment

A severe economic downturn leads to retrenchment.



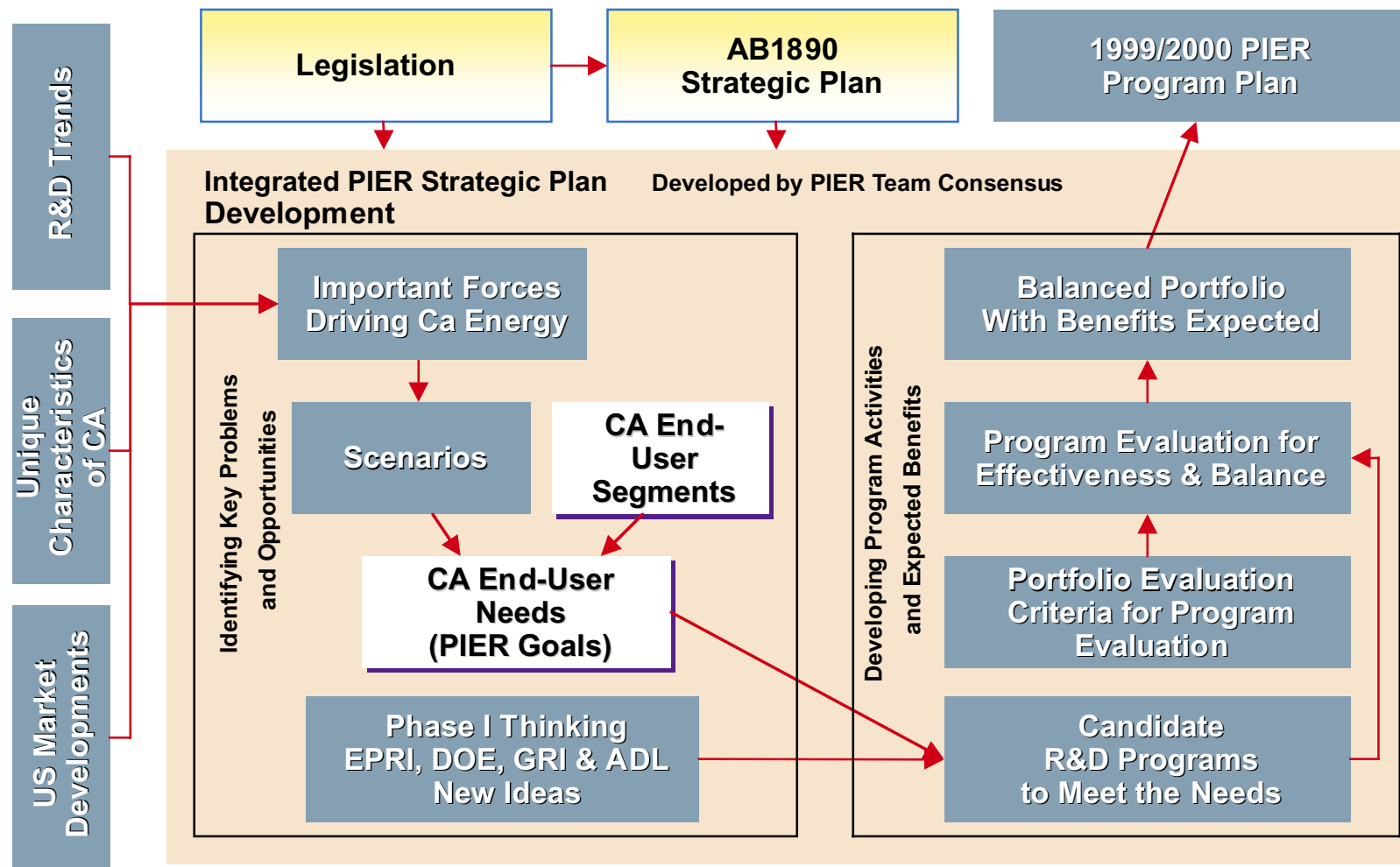
Risk Aversion

Although the national transformation of the energy industry and a small, powerful industrial segment promote the introduction of new products and services, these offerings are not widely adopted as the majority of consumers do not appreciate their value or are overwhelmed by the myriad of choices.



To construct the scenarios, the PIER Team selected 40 high impact, high uncertainty forces out of 125 identified forces.

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The PIER Team has selected 10 end-user segments. The societal segment provides a user category for collective needs such as environmental resources.

End User Segments

1. Homeowners
2. Renters
3. Commercial
4. Large commercial
5. Institutional
6. Petroleum/Refining, Chemicals, Natural Gas, Petrochemicals, Pharmaceuticals
7. Manufacturing
8. Manufacturing High-Tech
9. Agriculture, Food Processing, Water, Wastewater
10. Societal Needs

California end-users - Consolidated needs

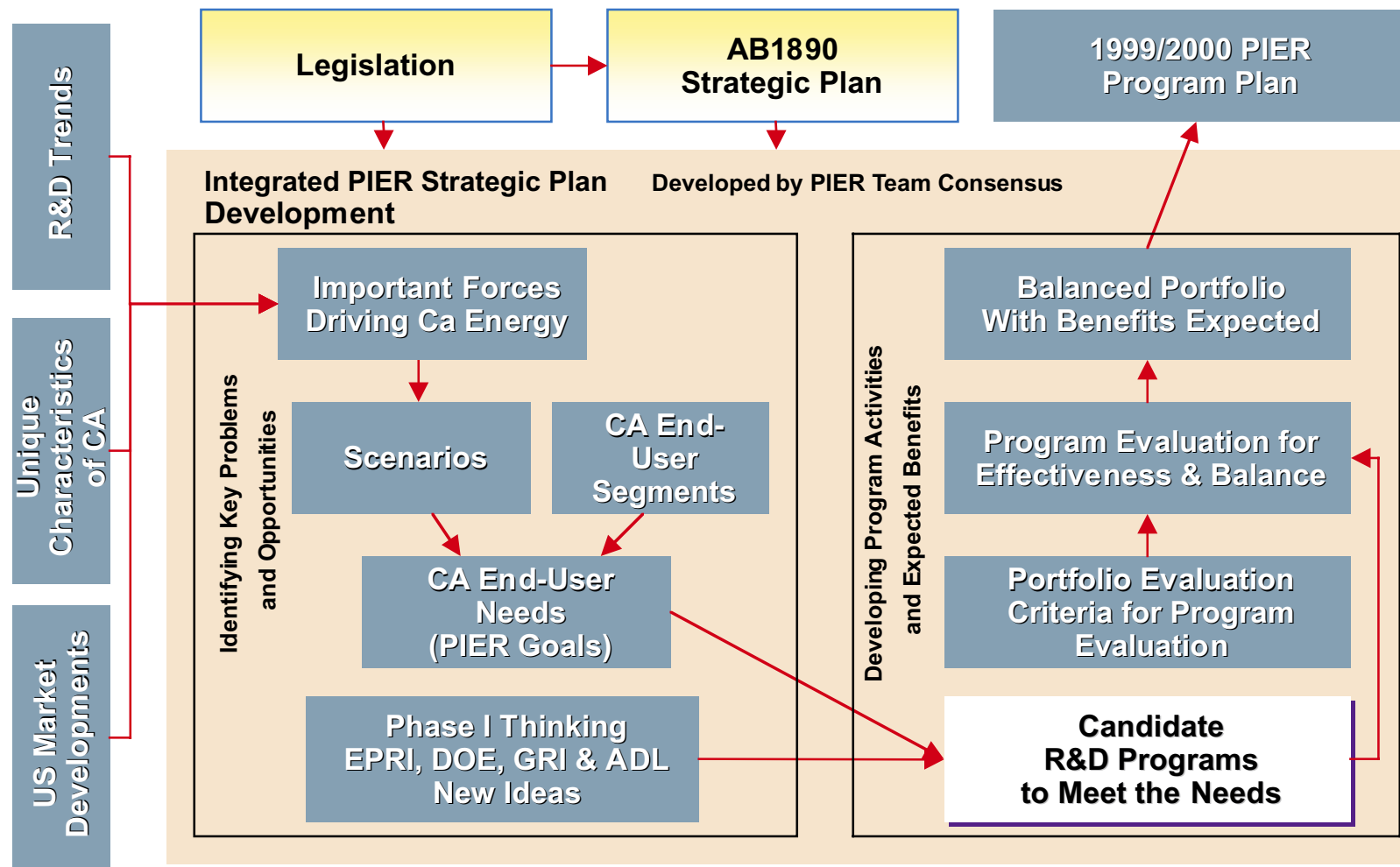
Over 200 End-User needs identified by the PIER Team have been consolidated and organized under four categories.

End-User Needs			
<i>Commercial</i>	<i>Economic</i>	<i>Societal</i>	<i>Product Service/Feature</i>
<ul style="list-style-type: none"> ¥ Commercially available retail energy products ¥ Concise, reliable information to facilitate informed energy choices ¥ Comfort/satisfaction with service provider (traditional/nontraditional) 	<ul style="list-style-type: none"> ¥ Effective load management ¥ Enhanced work environment for improved productivity ¥ Affordable housing ¥ Improved manufacturing process efficiency ¥ Enhanced property value ¥ Low-energy equipment capital cost ¥ Low-energy equipment operating cost ¥ Low-energy service cost (e.g., monthly bill) ¥ Reduced energy consumption 	<ul style="list-style-type: none"> ¥ Increased energy efficiency ¥ Improved water/waste water use and efficiency ¥ Replace toxic pesticides with alternatives ¥ Green energy solutions ¥ Improved waste management/recycling capability ¥ Adequate potable water supplies ¥ Personal security and privacy ¥ Minimize impacts of air, water, and land pollutants ¥ Rapid recovery from a natural disaster or environmental catastrophe ¥ Protect endangered species (e.g., habitat) ¥ Regulatory compliance ¥ Health and safety ¥ Basic energy service packages 	<ul style="list-style-type: none"> ¥ Do-it-yourself capability ¥ Retrofit capability ¥ Comfortable building environment food ¥ Food safety ¥ Fuel flexibility/switching capability ¥ Improved power quality ¥ Improved quality of life ¥ Simplicity and ease of use ¥ Marketing benefits/aesthetics (e.g., lighting, backup power) ¥ Portable value-added energy solutions ¥ Grid-independent energy solutions ¥ Energy supply security/reliability ¥ Support home office/entertainment/high tech requirements ¥ Building occupant special needs (e.g., biohazard waste, security)

Note: The four categories of Ratepayer needs are convenience headings.

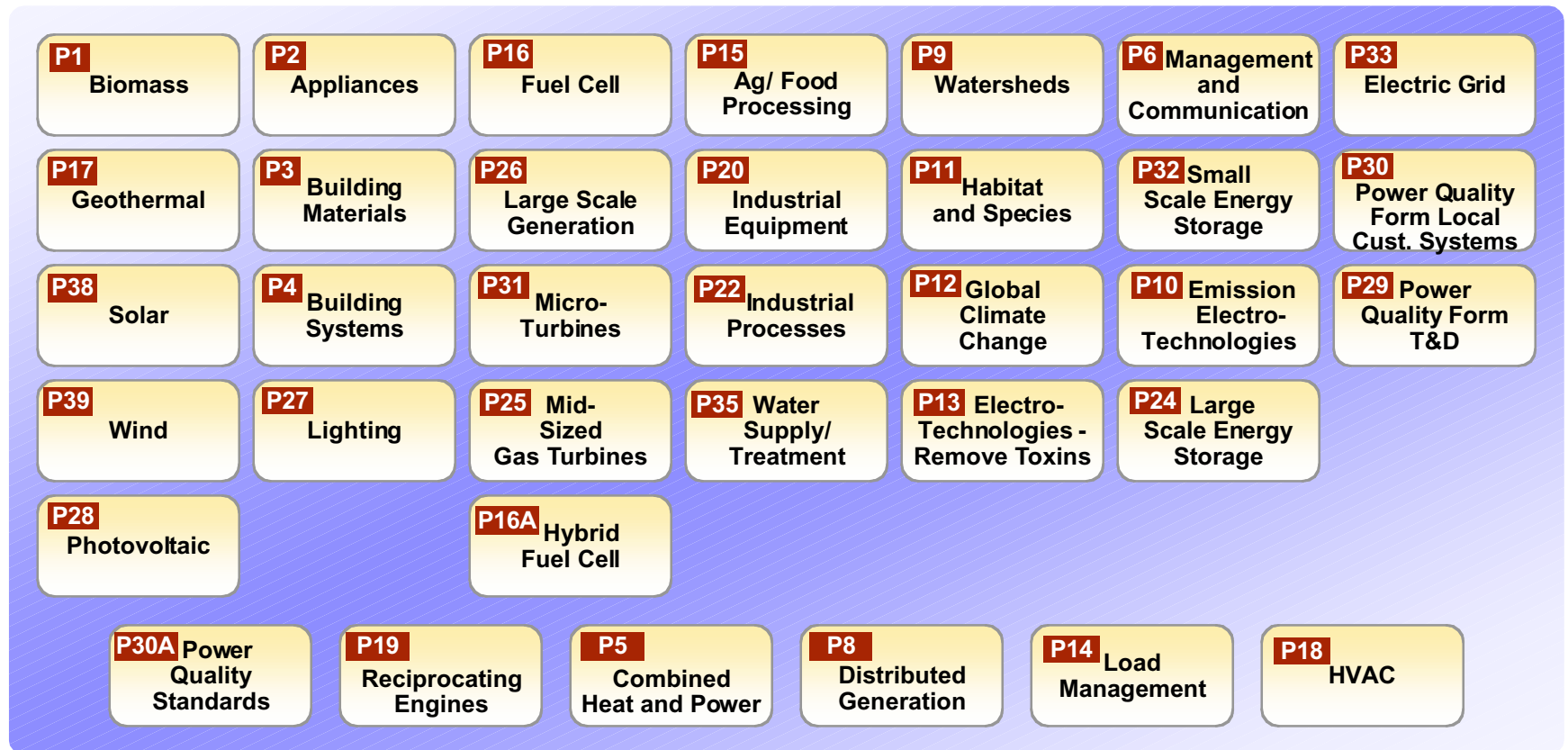
Developing a PIER Integrated Strategic Plan - Candidate RD&D programs

The PIER Team has focused on developing a California-specific strategy for Public Interest R&D. It includes linkages connecting the PIER mission to program strategy and expected benefits, reflecting IEP and PAC comments.



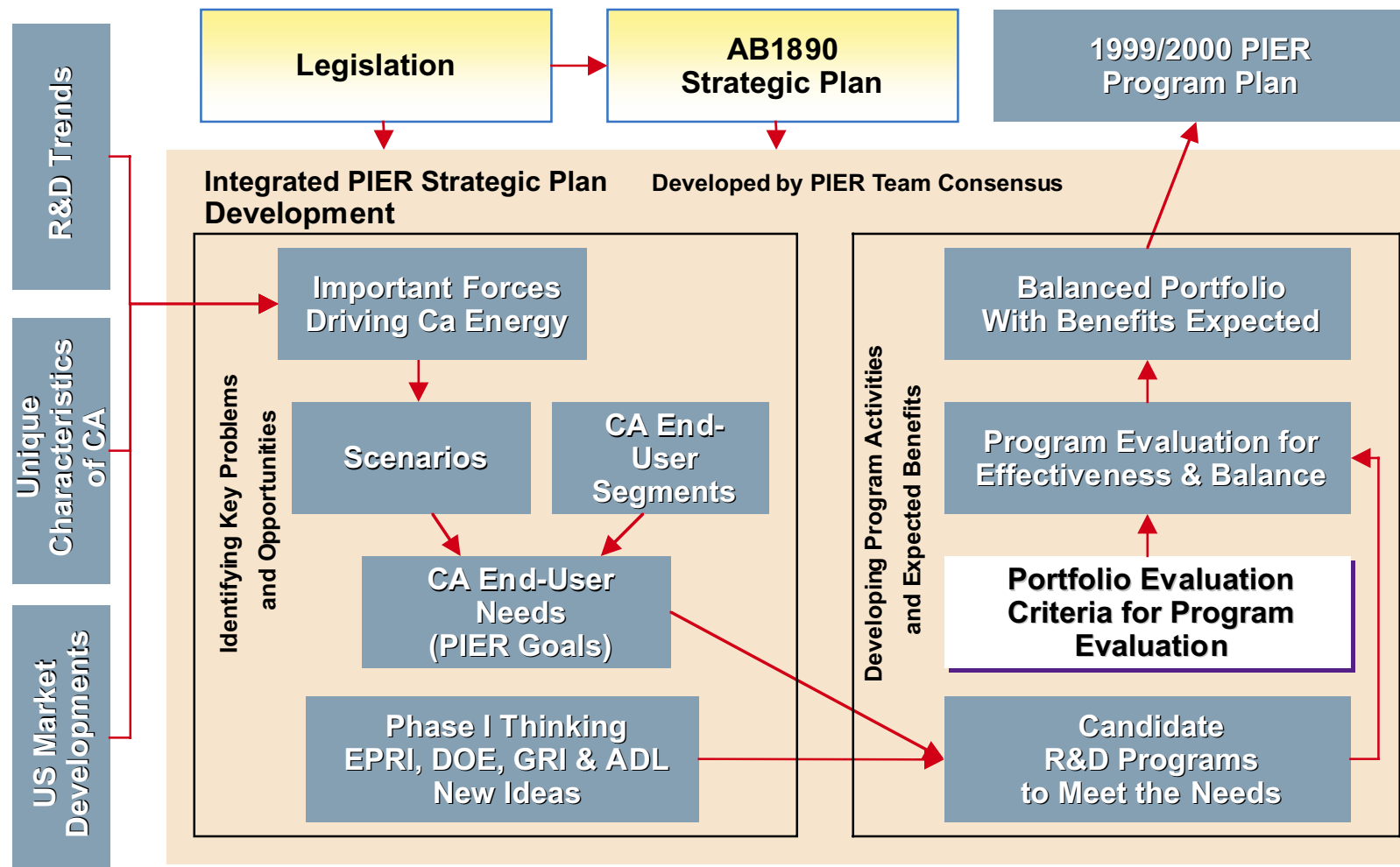
Candidate RD&D Programs - PIER Programs

The following 35 candidate programs are structured to address the identified needs of the End-Users.



The list was synthesized from over 200 innovative solutions (projects) identified by CEC staff and Arthur D. Little experts.

The PIER Team has developed a new generation of public interest criteria with metrics for program evaluation..



Program Evaluation Criteria - Screening for benefits

The Criteria and metrics are focused on determining the additional value that the PIER program can bring to California end users.

	Criteria	Key Questions/ Issues	Potential Measures	Metrics		
				Low	Medium	High
Screening for Inadequate Competitive/regulated R&D	Scope	¥ How broadly will the program benefit End-Users in California? ¥ Does the program change the rules in California?	¥ Number of segments addressed ¥ Magnitude of the impact within each segment ¥ Percentage of the segment impacted	Provide a list of segments that are impacted and the percent of penetration within each segment		
	Acceleration of Benefits	¥ Will the research accelerate the delivery of benefits to the End-User?	¥ Timing	¥ < 1 years	¥ 1-4 years	¥ > 4 years
	Timing of Benefits	¥ When will the benefits be realized in California?	¥ Timing ¥ When should the investment be made?	¥ > 7 years	¥ 3-7 years	¥ < 3 years
Public Benefit Economic	Economic Value (Direct Benefit)	¥ How much will the program improve the End-User's financial position?	¥ Annual cost savings to impacted customers	¥ Please provide an ANNUAL benefit dollar amount assuming a 10-year outlook (2010) and an explicit market penetration . ¥ An appropriate Lo/Med/High scale will be determined after economic numbers for all programs have been estimated.		
	Economic Value (Direct Benefit)	¥ How much will the program improve the overall California economy?	¥ Increase in worker productivity ¥ Job creation ¥ Export potential ¥ Economic value of non-energy benefit to CA ¥ Increase in Local/State tax base	¥ Please provide an ANNUAL benefit dollar amount assuming a 10-year outlook (2010) and an explicit market penetration . ¥ An appropriate Lo/Med/High scale will be determined after economic numbers for all programs have been estimated.		
	PIER Cost	¥ What will be PIER's cost of the research?	¥ Lifetime cost of the program to PIER	¥ > \$7 million	¥ \$3 million—\$7 million	¥ < \$3 million

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	Criteria	Key Questions/ Issues	Potential Measures	Metrics		
				Low	Medium	High
Public Benefit Strategic	Reliability/ Power Quality Safety	<ul style="list-style-type: none"> ¥ How quickly is the customer returned to service? ¥ How quickly can a customer respond to a reliability problem? ¥ How much flexibility does the customer have in system response? ¥ What is the reduction in outages experienced by the customer? 	<ul style="list-style-type: none"> ¥ Reduced number of outages ¥ Reduced duration outages ¥ Reduced under-voltage occurrences ¥ Ramp rate of load shedding ¥ Protective measures ¥ Peak demand reduction ¥ Focus on segments as well as grids 	Reliability <ul style="list-style-type: none"> ¥ Capacity/delivery reduction (peak & base) ¥ Ramp speed ¥ Outages Power Quality <ul style="list-style-type: none"> ¥ >2 outages per year ¥ Duration of outages: >1 cycle ¥ >20% under-voltage 	Reliability <ul style="list-style-type: none"> ¥ Capacity/delivery reduction (peak and base) ¥ Ramp speed ¥ Outages Power Quality <ul style="list-style-type: none"> ¥ 2 outages per year ¥ Duration of outages: less than 0.25 —1 cycles ¥ 10-20% under-voltage 	Reliability <ul style="list-style-type: none"> ¥ Capacity/delivery reduction (peak and base) ¥ Ramp speed ¥ Outages Power Quality <ul style="list-style-type: none"> ¥ 1 outage per year ¥ Duration of outages: less than 0.25 cycles ¥ 0-10% under-voltage
	<ul style="list-style-type: none"> ¥ Please provide absolute numbers for reliability/power quality. The metrics for power quality should just be used as a reference. ¥ If reliability/power quality does not apply to a program, please use NA (not applicable). 					
	Energy Use	<ul style="list-style-type: none"> ¥ Will this program materially reduce energy use in California? 	<ul style="list-style-type: none"> ¥ Energy consumption ¥ Peak demand ¥ Energy imports (reduce) 	<ul style="list-style-type: none"> ¥ —5%<x<5% 	<ul style="list-style-type: none"> ¥ 5—15% 	<ul style="list-style-type: none"> ¥ 15%
	Non-Energy Co-Benefits That Are Not Captured Elsewhere	<ul style="list-style-type: none"> ¥ Will the research lead to non-energy benefits that are important to California End-Users? 	<ul style="list-style-type: none"> ¥ Increase in public comfort ¥ Increase in public health and safety ¥ Increase in product durability/reliability ¥ Advancement of knowledge and science 	<ul style="list-style-type: none"> ¥ Low 	<ul style="list-style-type: none"> ¥ Medium 	<ul style="list-style-type: none"> ¥ High

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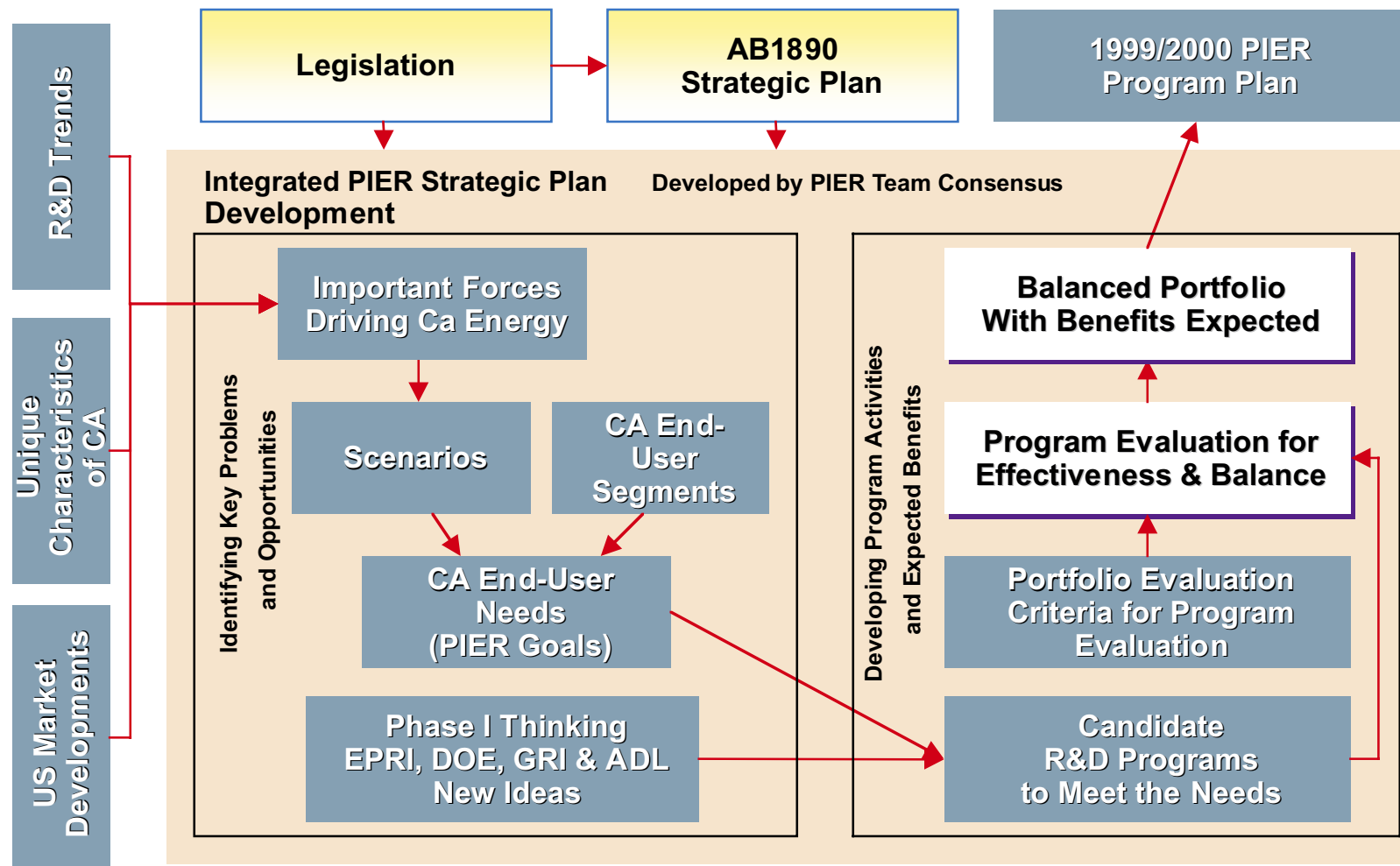
	Criteria	Key Questions/ Issues	Potential Measures	Metrics		
				Low	Medium	High
	Environmental Impact	¥ Will program results lead to significantly reduced environmental impacts (air, water, land) or increased understanding in California?	¥ <i>Percentage reduction or displacement in environmental release quantities from total power plant inventory</i> ¥ <i>Percentage reduction or displacement in each effluent stream from total power plant inventory</i>	¥ <10% reduction in associated release quantities ¥ <10% reduction in impact/risk	¥ 10—20% reduction in associated release quantities ¥ 10—20% reduction in impact/risk	¥ >20% reduction in associated release quantities ¥ >20% reduction in impact/risk
				Note: Use figures for a 45,000 MW power plant as baseline		
Public Benefit Environmental	Resource Consumption	¥ Will program results enable significant reductions in resource consumption (habitat, fresh water, materials) in California?	¥ <i>Percentage reduction in associated natural resource (non-energy) consumption</i> ¥ Percentage increase in resource availability	¥ <5% reduction in associated resource consumption ¥ <5% increase in associated resource availability	¥ 5—15% reduction in associated resource consumption ¥ 5—15% increase in associated resource availability	¥ >15% reduction in associated resource consumption ¥ >15% increase in associated resource availability
	Environmental Remediation	¥ Will the program result in new technologies that facilitate or accelerate remediation of existing sites in California?	¥ Extent to which program results and technologies are applicable to remediation site needs in California	¥ Minimal applicability	¥ Limited applicability	¥ Broad applicability
	Note: If an environmental criterion is not applicable to a program, please insert NA (not applicable) into the matrix.					

Program Evaluation Criteria - Screening for benefits

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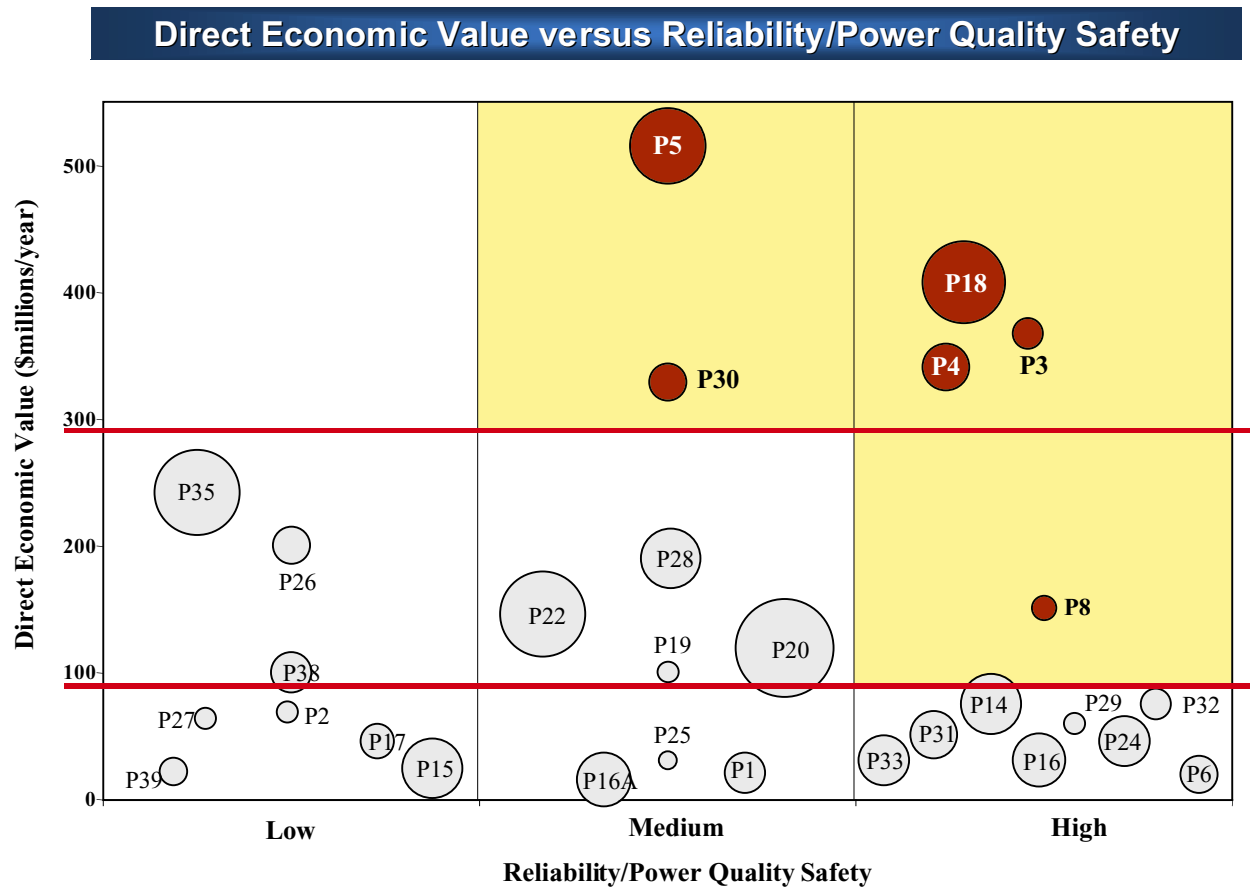
	Criteria	Key Questions/ Issues	Potential Measures	Metrics		
				Low	Medium	High
Market Connectedness	Probability of Technical Success	¥ How likely is it that the innovative solutions will be successfully developed ?	¥ Probability of technical success	¥ Low	¥ Medium	¥ High
	Implementation Feasibility	¥ How likely is it that, if developed, the intermediaries and enablers will facilitate the implementation of the innovative solution in California? (i.e., Can it be introduced?)	¥ Probability of intermediaries implementing the innovative solutions ¥ Probability of introduction at a competitive price ¥ Appropriability	¥ Low	¥ Medium	¥ High
	Probability of Market Acceptance	¥ How likely is it that if developed and feasible, the innovative solution will be accepted in the California market? (i.e., Does anyone want it?)	¥ Probability of market acceptance ¥ Regulatory adoption ¥ Pent-up demand	¥ Low	¥ Medium	¥ High
	Ability to Influence Public Policy	¥ How much will the CEC and the PIER program be able to influence public policy initiatives, if necessary to provide a level playing field?	¥ Regulations ¥ Incentives ¥ Information ¥ Facilitation	¥ Low (Federal and Regional measures required)	¥ Medium (State and local measures required)	¥ High (CEC has a role in initiating measures)

The overall PIER Team came to consensus on individual program evaluations and then developed a portfolio of high priority programs that balanced the benefits to all California end-users.



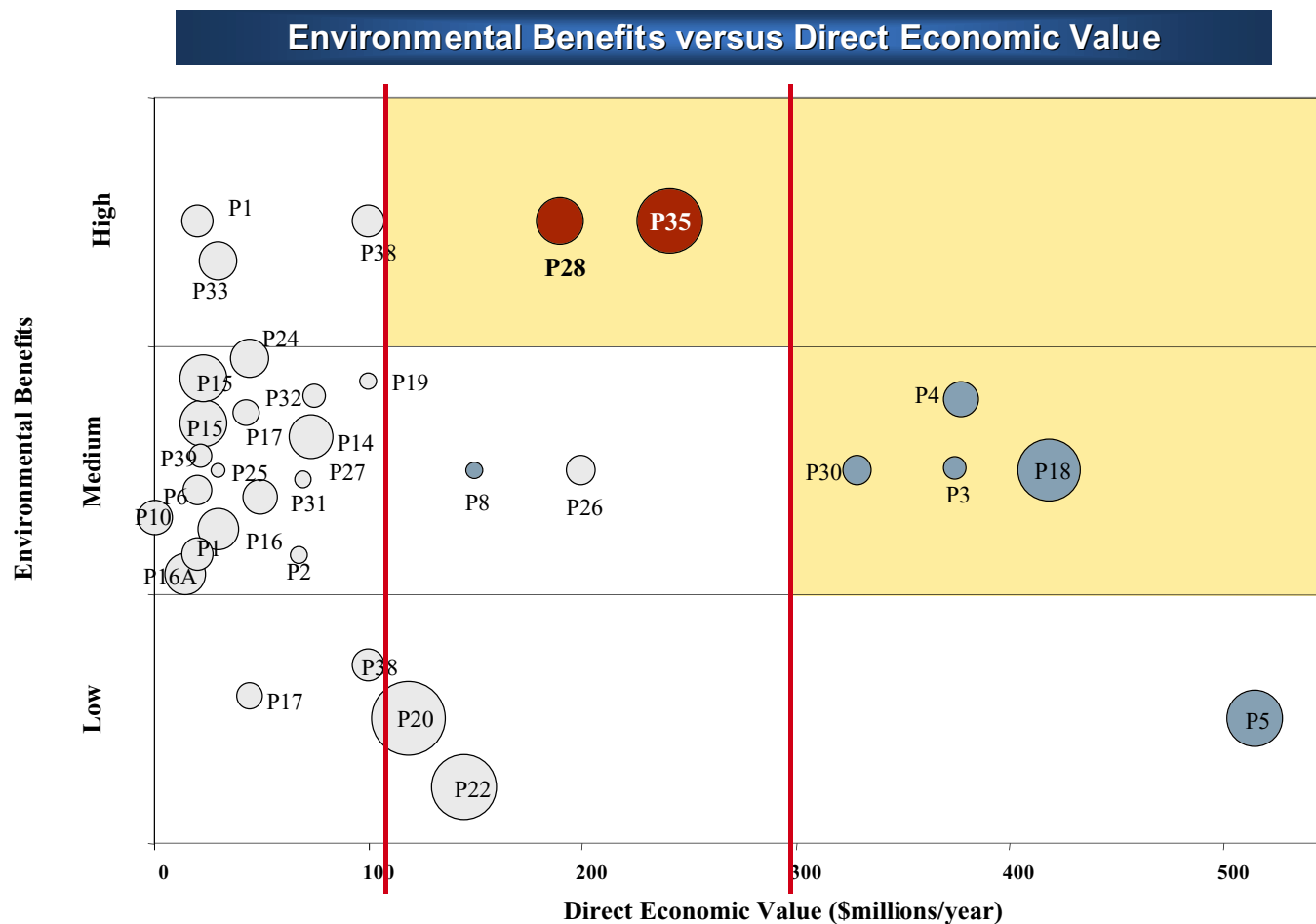
Developing the Portfolio - Maximizing benefit

By using the portfolio approach, the PIER Team was able to identify the programs which maximize benefits to California end users.



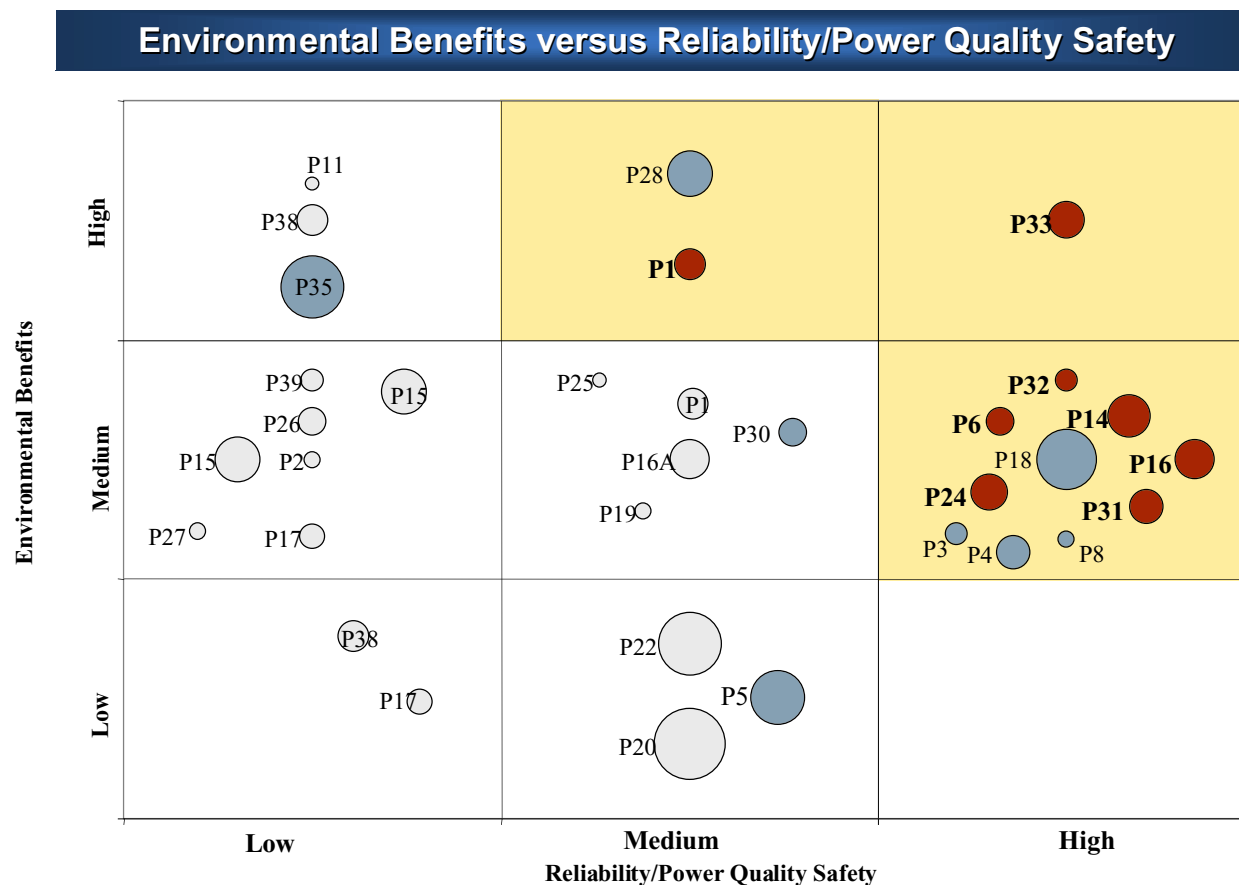
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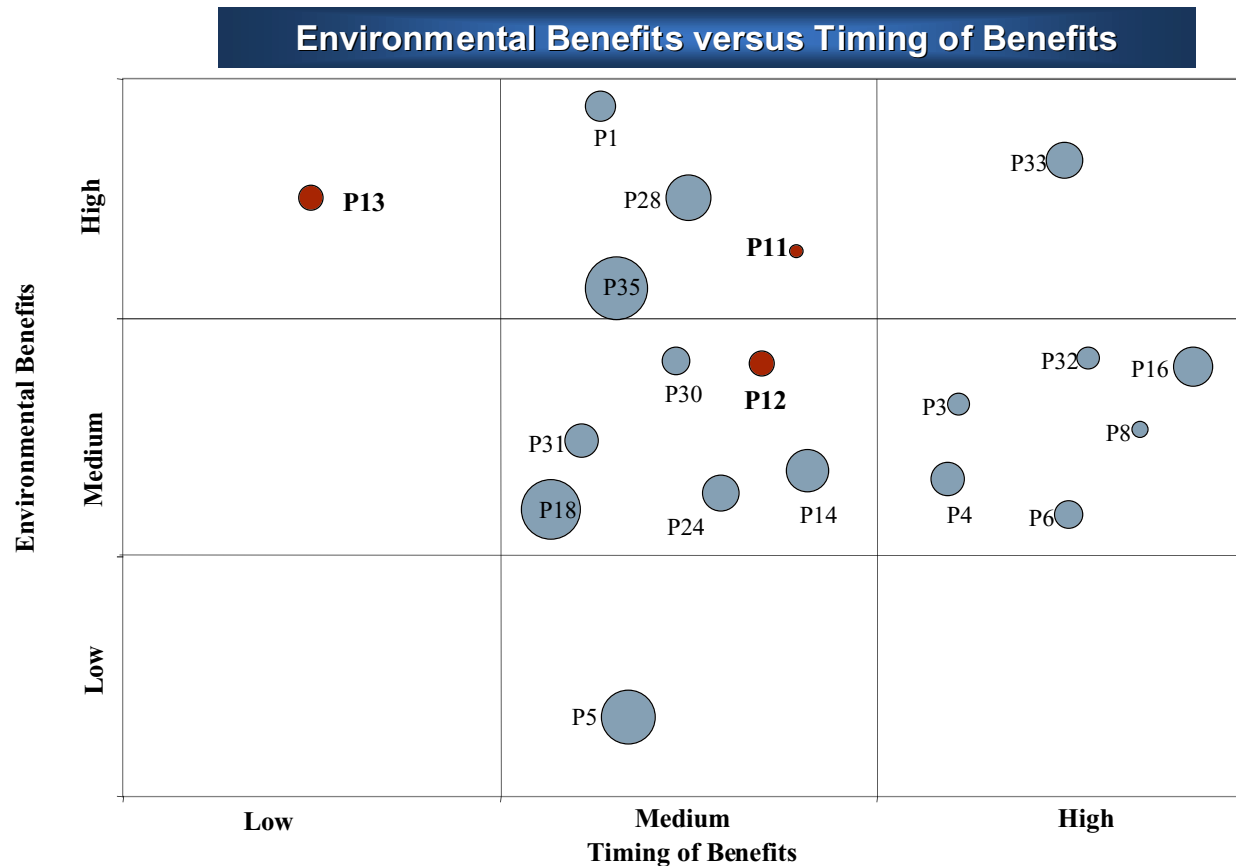


Once a portfolio was developed, the team applied a quality check to ensure priority components of the desired PIER RD&D portfolio were present.

Portfolio Balance	
¥	Environmental Programs (to meet societal interests)
¥	Timing of Benefits (near-term, mid-term and long-term benefits)
¥	Acceleration of Benefits
¥	End-User Benefits (benefits balanced across end-user segments)
¥	Reliability
¥	Power Quality / Safety
¥	Risk

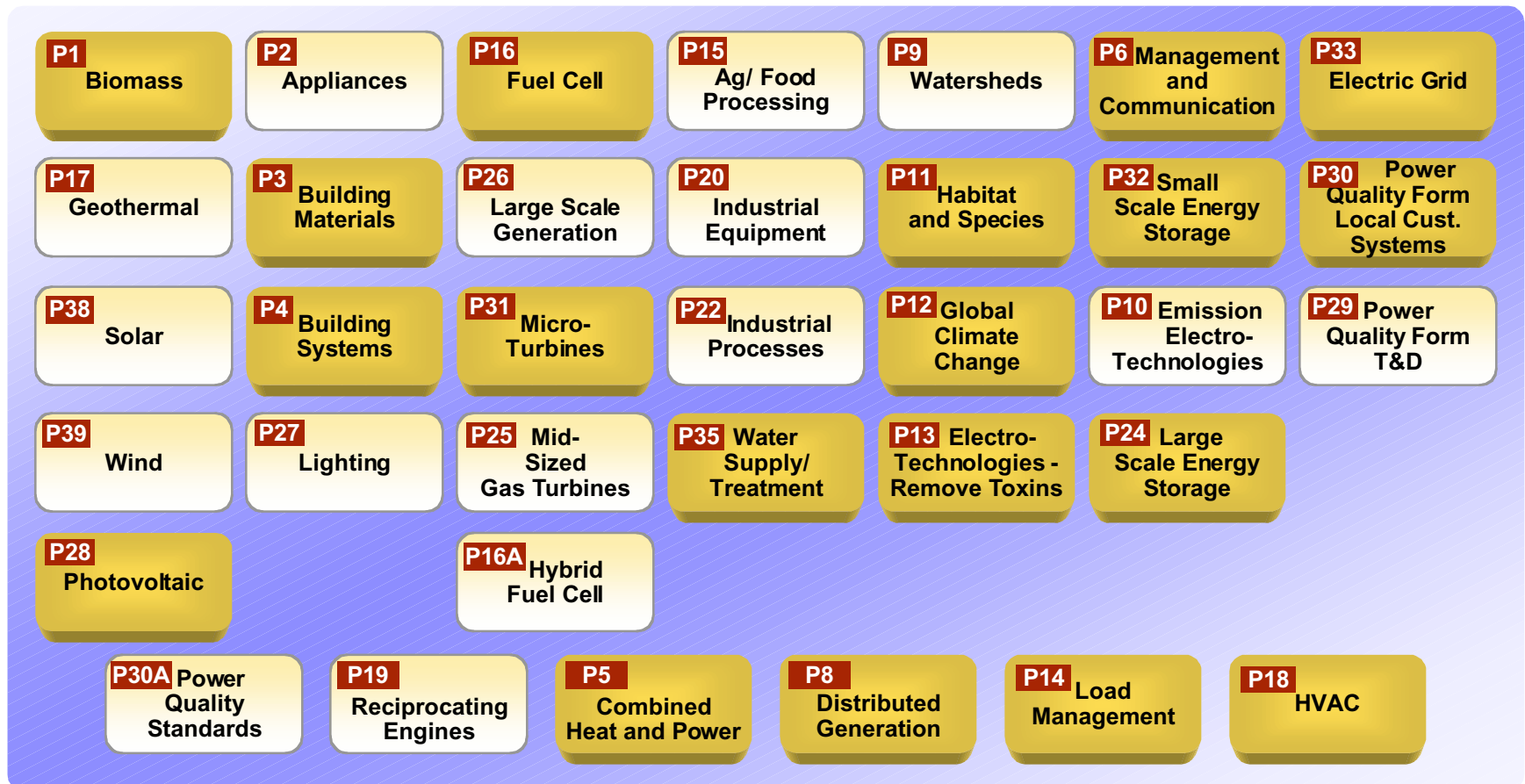
Developing the Portfolio - Example of balancing (Timing and Environmental)

Several programs provide phased benefits prior to adoption by target market. In addition, the PIER Team will explore methods to enhance near term benefits.



Balanced RD&D Portfolio - High Priority RD&D Programs

The following highlighted portfolio of high priority RD&D programs represents programs that will be recommended to the commission for funding.



There have been multiple wins for the PIER Team throughout the PIER Innovation Strategy Project.

Key PIER Wins

- 4 The development of a balanced portfolio of high priority RD&D programs**
- 4 Team lead commitment and participation**
- 4 Strategic integration across all six PIER focus areas**
- 4 Consensus on program evaluation criteria**
- 4 A process for prioritizing programs across all six PIER focus areas.**
- 4 Explicit links between PIER Programs and Public Interest Objectives**